ISO/IEC JTC1/SC22
Languages
Secretariat: CANADA (SCC)

ISO/IEC JTC1/SC22
N732

OCTOBER 1989

TITLE: Minutes of the third Plenary Meeting of JTC1/SC22 held in Berlin Germany FR, 1989-09-26/29

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New

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Minutes of Plenary Meeting

ACTION: For review and action as appropriate by SC22 Member Bodies.

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1. Opening of Meeting:

Mr. Klaus-Peter Schulz of the Deutsch Institute für Normung and secretary of DIN/JTC1 opened the third Plenary Meeting of ISO/IEC JTC1/SC22 by welcoming all delegates to Berlin. Mr. Schulz briefly described DIN's participation in international standardization.

In closing, Mr. Schulz wished SC22 much success in its deliberations during the days ahead and invited all delegates and their spouses to attend a sightseeing tour and dinner in their honour on Wednesday, September 27, 1989.

2. Chairman's Remarks

Mr. J. Côté, secretary of JTC1/SC22, thanked Mr. Schulz and DIN for hosting this Plenary meeting of SC22. He then informed SC22 Member Bodies of Mr. R. Kearney's resignation from the chairmanship and conveyed Mr. Kearney's apologies for not being able to attend this meeting. He referred delegates to document SC22 N703 which contains a letter from Mr. Kearney to SC22 Heads of Delegation.

Mr. Côté then went on to inform SC22 Member bodies of the Standards Council of Canada's intent to relinquish the Secretariat of SC22, effective after the next SC22AG meeting scheduled for the Fall of 1990.

Finally, the secretary explained that he had asked Mr. F. Genuys (France) to chair the meeting.

As their were no objections, Mr. Genuys took the chair.

Mr. Genuys indicated that it was very unfortunate that Mr. Kearney could not be at this meeting but that he would try to chair the meeting appropriately.

3. Roll Call of Delegates

The secretary proceeded with the roll call of delegates. It was noted that 13 'P' members and 1 'O' member were in attendance. The attendance list is contained in document N726.

4. Appointment of Drafting Committee:

The chairman appointed the following delegates to the drafting committee:

I. Korn (Chairman) - Denmark
J. Hill - USA
G. Schmitt - Austria

B. Meek - UK
B. Leroy - France

The chairman then invited Mr. T. Holka, Vice-Chairman - Application and Elements Grouping to say a few words. Mr. Holka expressed sincere thanks to Mr. Kearney for his past contributions to the committee. He went on to say that he was happy to see the number of countries represented at this meeting. Mr. Holka also expressed his views of the importance of the work of this committee and noted that the SC22 was currently not well represented on JTC1 special groups.

5. Adoption of Agenda:

The agenda was adopted with the addition of the following items:

7.3.0	Overview of CEN/CENELEC activities
8.11.4	Overview of X/OPEN
11.12	FDT's
11.13	Character Handling Requirements
8.8.4	WG12 presentation on Conformity and Validation
11.9.1	Presentation on VDM
11.9.2	Presentation on C++

6. Report of the Secretariat

The secretary referred delegates to document N645 and reminded Working Group Convenors of their duties to provide updating information on a regular basis.

The Netherlands asked about the status of the OSCRL project and the secretary indicated that JTC1 had not yet transferred this project to SC22.

7. Activity Reports

7.1 Report from Vice-Chair Application and Elements Grouping

Mr. Holka indicated that other than his comments made earlier, he had no other issues to raise at this time.

7.2 National Reports

The following National Activity Reports were tabled and presented by the respective Heads of Delegation:

Austria - N719
Canada - N704
Denmark - N706
Finland - N717
France - N681
Germany FR - N722
Japan - N716
UK - N709
USA - N697

It was noted that the Netherlands' report will be submitted at a later date.

In addition, other Member Bodies presented the following reports:

Sweden

The HOD reported that the submission of programming language Simula, for Fasttrack processing as per a previous invitation from SC22, had been delayed as the standard did not conform to ISO drafting rules but that it was expected to be submitted soon to ISO.

USSR

The HOD reported that activities in this area in the USSR included PL/1, Pascal, Fortran, Modula 2, Lisp and Ada standardization.

He also reported that Letter Ballots are often received very late and even, sometimes, after the closing date. Finally, he indicated the USSR will adopt some ISO standards.

At this point the UK said they were pleased to have the USSR represented at this meeting and hoped that the USSR would send delegates to the next SC22 Advisory Group meeting to be held in the UK, in 1990.

German Democratic Republic

The GDR delegate reported that GDR joined SC22, as 'O' Member in 1988 and intends to develop cooperation with ISO Member Bodies. He explained that a National committee had been established and that national standards have to conform with ISO standards. He indicated that Fortran 77 and Pascal standards had been published

and that they are planning to publish standards for Cobol, Ada, Basic and Modula 2.

At this point, the UK expressed the same welcome to the delegate from GDR, for this meeting and for future meetings of SC22.

7.3 Liaison Reports - External to JTC1

As no external liaison organization was represented at the meeting, no report was presented.

7.3.0 Overview of CEN/CENELEC Activities

Mr. Korn, HOD from Denmark made an interesting presentation on CEN/CENELEC activities.

7.4 Report of Liaison Officer

7.4.1 Liaison officer to SC2

It was noted that document SC22 N622R had been presented to SC2/WG1 and WG2 but not to SC2. The next Plenary meeting of SC2 is scheduled for April 1990. It was also noted that SC22 should ask SC2 to identify changes in their DP revisions. Finally, it was noted that a liaison officer to SC2 should be appointed to replace Mr. Holka.

7.4.2 Liaison Officer to SC7

Mr. Côté reported that there were currently no issues from SC7 of concern to SC22.

7.4.3 Liaison Officer to SC14

Mr. Nelson, convenor of SC22/WG11 indicated that, due to its current membership, WG11 was not capable of offering a good liaison to SC14.

7.4.5 Liaison to SC15

It was noted that SC15 had been disbanded.

7.4.6 Liaison Officer to SC21

No report was presented as there is currently no liaison officer to SC21.

7.4.7 Liaison Officer to SC21/WG3

Mr. Korn reported on the activities of SC21/WG3 -Database. He indicated that SQL2 should be registered as a DIS in November and explained the different levels of the language as well as the Integrity Addendum.

7.5 Report from HOD/C meeting

Mr. Korn, Chairman of the drafting committee, presented the recommendations prepared during the HOD/C meeting. The recommendations were reviewed and discussed.

7.6 Report from Ad Hoc Group on Character Handling Requirements and Joint Meeting of SC22, SC21/WG3 and SC2

Mr. Genuys, chairman of the Ad Hoc Group, referred delegates to the following documents:

N621 - Minutes of the Paris Ad Hoc Meeting
N622 and N623 - Reports produced by the Paris Ad Hoc Group
N622R and N623R - Reports produced during the Joint Meeting of SC22, SC21/WG3 and SC2 (Geneva)

It was noted that these reports should be reviewed by an Ad Hoc Group, to be created during this Plenary meeting.

8. Working Group Reports

8.1 WG2 - Pascal

On behalf of Dr. Wichmann, convenor of WG2, Mr. Joslin tabled and presented his report, document N710. It was noted that WG2 recommended DIS processing of Pascal (ISO 7185 - revision) and Extended Pascal (DP10206)

Resolutions 124 and 125 refer.

8.2 WG3 - APL

On behalf of Dr. Dickey, convenor of WG3, Dr. Warren tabled and presented his report, document N705. It was noted that WG3 requested direction from SC22 concerning the processing of Extended APL and other extensions where consensus cannot be reached at this time.

Resolution 126 refers.

8.3 WG4 - Cobol

Ms. L. Willis, convenor of WG4 tabled and presented her report, document N688.

8.4 WG5 - Fortran

On behalf of Ms. J. Martin, convenor of WG5, Mr. G. Schmitt referred delegates to her report, document N680. In addition the following documents were referred to:

N691 - SC22/WG5 Convenor's report
N692 - Second DP1539
N664 - Letter from WG5 & X3J3(Fortran) re: Synchronization
N697 - USA's National Activity Report
N723 - Austria's contribution on: NWI proposal

Following a lengthy discussion of the current situation with the Fortran standardization, it was agreed that this issue be discussed by an Ad Hoc Group, during this Plenary meeting.

8.5 WG8 - Basic

On behalf of Mr. Kurtz, convenor of WG8, Mr. Leroy, member of WG8, tabled and presented Mr. Kurtz's report, document N686. It was noted that WG8 recommended that DP10279 be sent to ISO/ITTF for DIS processing.

Resolution 128 refers.

8.6 WG9 - Ada

Dr. Mathis, convenor of WG9 referred delegates to his report, document N712 and to document N713 which addresses the Ada/SQL interface project. It was noted that WG9 requested that SC22 forward document N713 to JTC1, requesting the assignment of the Ada/SQL project to SC22.

Resolution 131 refers.

8.7 WG11 - Language Bindings

Mr. D. Nelson, convenor of WG11 tabled and presented his report, document N711. Following some discussion of the current need for additional members to this working group, and the importance of the projects assigned to WG11, it was agreed that SC22 Member Bodies and Language Working Groups be contacted.

Resolution 106 refers.

8.8 WG12 - Conformity and Validation

On behalf of Dr. J. Sidi, convenor of WG12, Mr.Genuys tabled and presented her report, document N714. In addition, Mr. Genuys made a presentation on Conformity and Validation Issues on behalf of Dr. Sidi. This presentation is contained in document N715.

Resolutions 108, 109 refer.

8.9 WG13 - Modula 2

Dr. R. Henry, convenor of WG13 tabled and presented his report, document N720. He indicated that WG13 recommended that a revised version of N682 be registered as a DP and asked for guidance as to the appropriate time for a document to be advanced from Working Draft to DP.

Resolution 127 refers.

8.10 WG14 - C

In the absence of Mr. Plauger, convenor of WG14, his report, document N702 was tabled and discussed.

Resolution 129 refers.

8.11 WG15 - POSIX

Mr. J. Isaak, convenor of WG15 tabled and presented his report, document N701. In addition, Mr. Isaak explained the proposed subdivision of project JTC1.22.21 and referred delegates to the disposition of comments report, document N651. It was noted that WG15 recommended the registration of document N690 as DP.

Resolutions 136, 137, 138, 139, 140 refer.

8.11.4 Overview of X/OPEN

Mr. R. Zimmer (GFR) gave an interesting presentation on X/OPEN. The slides used during his presentation are attached to these minutes. Following his presentation, the Cobol WG convenor pointed out that the Cobol standard listed in XPG3 has not been implemented anywhere.

8.12 WG16 - Lisp

On behalf of Mr. C. Queinnec, convenor of WG16, Mr. Bourstin, secretary of WG16, tabled and presented the convenor's report, document N725. The UK expressed some concern about the WG standardizing four different Lisp versions. Dr. Mathis pointed out that there were major differences between the different versions of Lisp.

8.13 WG17 - Prolog

Mr. R. Scowen, convenor of WG17 tabled and presented his report, document N718. He indicated that WG17 requested direction from SC22 as to the appropriate time to proceed from the Working Draft to the DP stage. Mr. Scowen also asked SC22 whether library routines could be transferred between one language to another.

8.14 WG18 - FIMS

Dr. J. Frantz, convenor of WG18, tabled and presented his report, document N721. He indicated that WG18 had an urgent need of members if SC22 wished to coordinate the international work with the work of ANSI.

At this point, Mr. Isaak indicated that WG15 - POSIX and WG18 will need to work together. He offered to work with Dr. Frantz in preparing Press Release material to stimulate participation in WG18.

9. Project Editors Report

9.1 Status of PL/I projects

In the absence of Dr. Klensin, PL/I Project Editor, his report, document N697 was tabled and reviewed.

Resolution 130 refers.

9.2 Status of Guidelines for Programming Language Standards project

Mr. B. Meek, Project Editor, reported that DTR10176 was currently being circulated to JTC1 Member Bodies for ballot.

Mr. Meek asked if there was any chance for the three Member Bodies, who voted against the document previously, change their vote.

It was noted that Germany FR and the Netherlands would now support it. The USA delegate indicated that the current DTR was improved but could not confirm the USA position.

The first session of the Plenary meeting adjourned at 19:00 hrs. on September 25, 1989.

The Plenary meeting re-convened at 9:05 hrs, September 26, 1989.

11. Outstanding Issues for Discussion

11.1 Preparation of International Standards

This item having been discussed by the HOD/C meeting it was agreed that no further discussion was required.

11.2 Delays with JTC1 Turnaround

This item having been discussed by the HOD/C meeting it was agreed that no further discussion was required.

11.3 Principles of Operation

It was agreed that this item be addressed by an AD Hoc Group.

11.4 Frequency of SC22 Plenary

This item having been discussed by the HOD/C meeting it was agreed that no further discussion was required.

11.5 SC22 Liaison Requirements

It was noted that liaison officers were required to SC1, SC2, SC21, JTC1/TSG1 and TSG on EDI.

Resolution 114 refers.

11.6 Confirmation of WG Convenors

The convenors of WG4 and WG9 were confirmed.

Resolution 112 refers.

11.7 Copyright - Extended Pascal

Having discussed this item at the HOD/C meeting it was agreed that no further discussion was required.

11.8 Subdivision of Project JTC1.22.21 - POSIX

The HOD from GFR referred to document N651 and indicated that GFR was prepared to change its vote to 'yes' provided that more information such as:

- Harmonization strategy
- Schedule of project, notice of change of direction
- Dates of meeting

was provided by the WG15 convenor.

It was agreed that the issue of harmonization be discussed by an AD Hoc Group.

11.9.1 VDM

Mr. D. Andrews (UK) gave an interesting presentation on VDM which was followed by a discussion of the proposed NWI. A copy of the slides used by Mr. Andrews is attached to these minutes.

11.9.2 C++

Mr. R. Holman (USA) gave an interesting presentation on current activities in C++ standardization in the USA. The presentation was followed by a general discussion of C++ standardization. A copy of the slides used by Mr. Holman is attached to these minutes.

The Plenary meeting adjourned at 11:45, September 27, 1989.

Two Ad Hoc Groups were then convened. One on Character Handling Requirements, chaired by Mr. J. Van Wingen (Netherlands) and the other on Principles of Operation and Internationalization, chaired by Mr. R. Follett (USA).

The Plenary meeting re-convened at 9:30, September 28, 1989.

11.10 Membership of WG18 - FIMS

It was agreed that this item did not require further discussion.

11.11 Proposal for a New Task for WG12

Following a general discussion of the WG12 proposal and considering the summary of voting of the proposal (N634) and noting the resignation of the convenor of WG12, it was agreed that WG12 should be disbanded since its two projects were practically complete.

Resolutions 108 refer.

11.9.3 MUMPS

The HOD from the USA indicated that the ANSI MUMPS standard would be submitted to JTC1, for fasttrack processing, as soon as the latest revision (expected for Nov/89) is available.

The Ad Hoc Groups were re-convened at 12:00 noon, September 28, 1989.

The Plenary meeting re-convened at 17:30 hrs., September 28, 1989.

The chairman of the Ad Hoc Group on Character Handling Requirements, Mr. J. Van Wingen reported on the discussion of this group as follows:

- the group agreed that the proposed NWI, prepared by the USA Member Body, on Functionality for Internationalization of Applications, should be forwarded to JTC1 for ballot.

- the group reviewed document N623R and it was agreed that SC22 should endorse it.

- the group reviewed document N622R and it was felt that it would be difficult to reconcile the positions of SC2 and SC22.

- the group recommended that this Ad Hoc Group continue its work, as much as possible by correspondence, and that it presents its final report at the next meeting of the SC22AG. Dr. Ellis (UK) was proposed as the chairman.

The chairman of the Ad Hoc Group on Principles of Operation, Mr. R. Follett reported on the discussion of this group as follows:

- the group discussed the issue of Synchronization and as a result, document N730 was prepared.
- the group discussed the current procedure for DP registration and the current Fortran standardization issue.
- the group discussed the proposal to hold annual Plenary meetings but it was reported that two countries (USSR and Netherlands) were still against it.

The Plenary meeting adjourned at 18:40 hrs. September 28, 1989 and re-convened at 10:15 hrs on September 29, 1989.

12. SC22 Administrative Issues

12.1 Voting

The SC22 secretary pointed out that many letter ballots were either not returned or returned after closing date. It was suggested that SC22 Member Bodies pay special attention to Letter Ballots.

12.2 Document Distribution

The SC22 secretary reminded WG convenors of their obligation to distribute WG documents in accordance with ISO/ITTF directives. The SC22 secretary agreed to send to WG convenors a copy of the current SC22 mailing lists (HOD list and P,O,L members list).

12.3 Review of 5-year meeting schedule

It was noted that future meetings of SC22 were as follows:

SC22AG, Oct. 10-12/90 - UK confirmed
SC22 Plenary, Fall 91 - Austria tentative
SC22AG or Plenary, 1992 or 1993 - Denmark
SC22AG or Plenary, 1993 or 1992 - France
SC22AG or Plenary, 1994 - The Netherlands
SC22AG or Plenary, 1995 - UK or USA

At this point, delegates expressed their appreciation to Mr. G. Schmitt for his coordination of the electronic mail service provided to SC22 Heads of Delegation.

13. Appointment of SC22 Chairman

The secretary indicated that, when the agenda was proposed, Canada had not officially decided to relinquish the Secretariat and had therefore anticipated the nomination of a permanent chairman. However he informed delegates that the SC22 Secretariat will nominate, within 30-60 days, an interim chairman for SC22. He further indicated that Mr. R. Follett (USA) would likely be nominated.

Finally, he indicated that should a Member Body be prepared to assume the SC22 Secretariat responsibility, then that country should nominate the chairman of SC22.

14. Other Business

The SC22 secretary agreed to send the mailing list of convenors to the Heads of Delegation and the mailing list of heads of delegation to the Convenors.

Since the USSR delegates had to leave at this point, the USSR HOD thanked all delegates, the host and the chairman for their kind reception. He also indicated that the USSR had delegated their vote on Resolutions to the delegate from the GDR.

15. Approval of Resolutions and Statement of Results

Resolutions 98 to 147 prepared at the third Plenary Meeting of ISO/IEC JTC1/SC22 were approved as reported in document N729.

16. Adjournment

Before adjourning the meeting, the Vice-Chair of Application and Elements Grouping was invited to comment on the meeting.

His remarks were made as follows:

- the drafting committee was very efficient
- many reasons to be pleased with the results of this meeting
- SC22 Working Groups are no longer separate entities, rather, they wish to cooperate with each other

- SC22 anticipates future end-user requirements: portability, internationalization
- SC22 has made great improvements over the last few years.

Mr. Genuys, acting Chairman thanked all delegates for their participation in this meeting.

The Canadian HOD expressed his appreciation to Mr. Genuys for having accepted to chair this meeting in replacement of Mr. R. Kearney.

The meeting was adjourned at 16:15, September 29, 1989.

Respectfully submitted,

J.L. Cote,
Secretariat, JTC1/SC22

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BERLIN-8

Vol 1	XSI Commands and Utilities	333
Vol 2	XSI System Interfaces and Headers (incl. Inter-Process Communication)	679
Vol 3	XSI Supplementary Definitions (Internationalisation, Curses Interface, Source Code Transfer)	183
Vol 4	Programming Languages (C, COBOL 85)	197
Vol 5	Data Management (ISAM, SQL)	203
Vol 6	Window Management (X Window System)	337
Vol 7	Networking Services (Transport Interface, PC Interworking)	143
		2075 Seiten

X/Open Portability Guide Komponenten	XPG1 85	XPG2 87	XPG3 88
system interface and headers	B	B vsx	B vsx
C	B	B vsx	B vsx
commands and utilities		B	B
internationalization		E vsx	B vsx
ISAM	E	E vsx	E vsx
COBOL	E	E v	E v
FORTRAN	E	E v	E v
Pascal		E v	E v
SQL		E	E
terminal interfaces		E	E
window management			E
transport interface			E
PC interworking			E
source code transfer	O	O	O
inter-process communication		O	O
Ada			O v

B = noetig fuer BASE Warenzeichen
E = noetig fuer PLUS Warenzeichen
O = optional fuer Component Warenzeichen

Pruefmittel:
vsx = X/Open Verification Suite
v = andere offizielle Pruefmittel

CAE Topic	Status: X/Open	Status: IEEE	Status: JTC1
System Interfaces and Headers	XPG2,3 abgeschl. enthaelt IEEE	abgeschl., supplement ballot 4.89	Rev.DIS bevorstehend
Real-Time Interfaces Event Management	XPG4 4Q89	P1003.4 M.90	SC22 NWI ballot
C Language Bindings	XPG3 1988	P1003.1	SC22 NWI ballot
Ada Language Binding	leer	P1003.5 2Q89	SC22 NWI ballot
Commands/Shell and Utilities	XPG2,3 abgeschl. Rev.XPG4 mit IEEE 2Q90	P1003.2 1Q90	SC22 NWI ballot
Internationalisation	XPG2,3 abgeschl.	leer	leer
Multibyte Internationalisation	XPG4 4Q89	leer	leer
ISAM	XPG2,3 abgeschl.	leer	leer
Terminal Interface	XPG2,3 abgeschl.	P003.1 (1991)	leer
X Window System (Xlib)	XPG3 abgeschl.	(X3H3.6) neu	leer
X Intrinsics	XPG4 2Q89	P1201 neu	leer
X Core Components	XPG4+ 4Q89	P1201 neu	leer

CAE Topic	Status X/Open	 IEEE	 JTC1
Transport Interface	XPG3 abgeschl.	leer P1003.8 ?	leer SC22 NWI ballot ?
PC Interworking - Terminal Emul.	XPG3 abgeschl.	leer	leer
PC Interworking - SMB	XPG4 2Q89	leer	leer
PC Interworking - NFS	XPG4 2Q89	leer	leer
Mainframe Interworking	XPG4 4Q89	leer P1003.8 ?	leer SC22 NWI ballot ?
Network Services Distribution Services	neu	P1003.8 neu	SC22 NWI ballot
Security Interfaces	XPG4	P1003.6 ballot M.90	SC22 NWI ballot
System Administration	(neu)	P1003.7 (91/92)	SC22 NWI ballot
C Language	XPG4 ISO Adoption	(ANSI X3J11)	DIS bevorstehend
COBOL	XPG2,3 abgeschl.	leer	IS
SQL	XPG2,3 abgeschl.	leer	IS
Dynamic ESQL	XPG4 2Q89	leer	DP/DIS ?

CAE Topic	Status: X/Open	Status: IEEE	Status: JTC1
Verification and Test Methods	implicit	P1003.3 ballot 1Q89	leer
Verification Tests			
. System Interfaces	VSX2.5 1Q89 VSX3.1 2Q89	PCTS 2Q89	leer
. Internatonalisation	VSX2.5 1Q89 VSX3.1 2Q89	leer	leer
. ISAM	VSX2.5 1Q89 VSX3.1 2Q89	leer	leer
. Transport Interface	VSX3.2 4Q89	leer	leer
. X Window System	VSX4.1 2Q90 ?	leer	leer
. C Language	VSX2.5 1Q89 VSX3.1 2Q89	leer	leer
. COBOL	CCVS85 1.6	CCVS85 1.6	CCVS85 1.6
. FORTRAN	FCVS78 2.0	FCVS78 2.0	FCVS78 2.0
. Pascal	PVS 5.0	PVS 5.0	PVS 5.0
. Ada	ACVS 1.10	ACVS 1.10	ACVS 1.10
. SQL	VSX4.1 2Q90 ?	(NIST)	leer

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Technical Working Groups

- C Language
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- Commands
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COBOL	E	E v	E v
FORTRAN	E	E v	E v
Pascal		E v	E v
SQL		E	E
terminal interfaces		E	E
window management			E
transport interface			E
PC interworking			E
source code transfer	O	O	O
inter-process communication		O	O
Ada			O v

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X Intrinsics	XPG4 2Q89	P1201 neu	leer
X Core Components	XPG4+ 4Q89	P1201 neu	leer

X/Open, IEEE und JTC1 im Vergleich (2)

CAE Topic	Status: X/Open	Status: IEEE	Status: JTC1
Transport Interface	XPG3 abgeschl.	leer P1003.8 ?	leer SC22 NWI ballot ?
PC Interworking - Terminal Emul.	XPG3 abgeschl.	leer	leer
PC Interworking - SMB	XPG4 2Q89	leer	leer
PC Interworking - NFS	XPG4 2Q89	leer	leer
Mainframe Interworking	XPG4 4Q89	leer P1003.8 ?	leer SC22 NWI ballot ?
Network Services Distribution Services	neu	P1003.8 neu	SC22 NWI ballot
Security Interfaces	XPG4	P1003.6 ballot M.90	SC22 NWI ballot
System Administration	(neu)	P1003.7 (91/92)	SC22 NWI ballot
C Language	XPG4 ISO Adoption	(ANSI X3J11)	DIS bevorstehend
COBOL	XPG2,3 abgeschl.	leer	IS
SQL	XPG2,3 abgeschl.	leer	IS
Dynamic ESQL	XPG4 2Q89	leer	DP/DIS ?

CAE Topic	Status: X/Open	Status: IEEE	Status: JTC1
Verification and Test Methods	implicit	P1003.3 ballot 1Q89	leer
Verification Tests			
. System Interfaces	VSX2.5 1Q89 VSX3.1 2Q89	PCTS 2Q89	leer
. Internatonalisation	VSX2.5 1Q89 VSX3.1 2Q89	leer	leer
. ISAM	VSX2.5 1Q89 VSX3.1 2Q89	leer	leer
. Transport Interface	VSX3.2 4Q89	leer	leer
. X Window System	VSX4.1 2Q90 ?	leer	leer
. C Language	VSX2.5 1Q89 VSX3.1 2Q89	leer	leer
. COBOL	CCVS85 1.6	CCVS85 1.6	CCVS85 1.6
. FORTRAN	FCVS78 2.0	FCVS78 2.0	FCVS78 2.0
. Pascal	PVS 5.0	PVS 5.0	PVS 5.0
. Ada	ACVS 1.10	ACVS 1.10	ACVS 1.10
. SQL	VSX4.1 2Q90 ?	(NIST)	leer

Board of Directors - - - - - - Councils

- Technical Managers Group
  - Technical Working Groups
    - C Language
    - COBOL
    - Commands
    - Data Interchange
    - Data Management
    - Internationalization
    - Kernel
    - Networking Services
    - PC Interworking
    - Security
    - Transaction Processing
    - User Interface
    - Verification
- Marketing Managers Group

Councils

- Users
- Independent Software Vendors
- System Integrators
- Hardware Vendors

Formal Specifications

1

What is a specification?

A description of a system.
Can be:

1. How it works
   algorithm to describe behaviour

or

2. What it does
   do not say how!

2

Specifications

A "precise" specification must be:

- Unambiguous
- Non-contradictory
- Complete
- Usable

3

Possible Specification Languages

1. English
2. A programming language
3. A special-purpose language

4

Requirements of a Specification Language

- Formal
- Encourage abstract specifications
- Abstract Data Types

5

Styles of Formal Semantics

- W-grammars
- Denotational semantics
- Operational semantics
- Axiomatic semantics
- Algebraic semantics
- Attribute grammars

6

Methods

- OBJ
- VDM/Meta-IV
- BASIS
- SMoLCS
- LOTOS
- Estelle
- Z

7

Applications of Formal Methods

Specify Systems:

Computer systems in industry

Computer systems in Standards

8

List of Formal Language Definitions

- Ada
- CHILL
- Lucid
- minimal BASIC
- Modula-2
- Pascal
- PL/I
- Scheme
- SNOBOL
- Algol 60
- APL
- LISP
- Algol 68
- Dijkstra family

9

Formal Methods in Standards

From an ANSI Ad Hoc Committee:

"The disadvantages of formal specifications are that their meta-language is often difficult to read, and that writing the specification may be tedious."

10

The Present

Language Definitions
- Modula-2 standard is formal
- Formal definition of C rejected
- Formal Ada standard
- etc

11

The Future

- Graphics
- Database
- ?

12

Requirements of a Language Definition

A "precise" definition of a programming language must be:

- Unambiguous
- Non-contradictory
- Complete
- Useable

Mathematical techniques allows the expression of definitions without giving algorithms.

A Compiler to Define a Programming Language?

Which Compiler?

A Compiler to Define a Programming Language

- what if it is badly written?
- what about bugs?
- what about machine dependencies?
- what about ...

Use a stylised version of English?

See ANSI/ECMA PL/I Standard:

- Big
- Brutal
- Boring
- But <u>Accurate</u>

A Solution?

Use mathematics:

- can be very abstract
- can be very precise
- 3,000 year track record

Mathematical techniques allows the definition of a programming language to be done with great precision.

A Formal Definition of a Programming Language

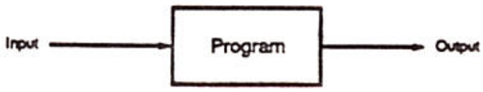
A formal definition will:

(a) define a standard program

(b) give a meaning to a standard program.

The Meaning of a Program

Each program defines a function from all possible inputs to outputs



Program : Input → Output

Technique

Define a function M

M[program] = P

M : Denotation → (Input → Output)

P : Input → Output

M is the formal definition of the programming language

Tools

Use mathematically familiar tools

functions

f, g, ...

function composition

f∘g

function definition e.g.

pmult(x,y) ≜ if x=0 then 0 else y+pmult(x-1,y)

Meaning of a Program

```
M[ program x;
   var a,b : Integer;
   begin
     a:=0;
     b:=1;
     a:=a+b
   end.
 ]
```

More Detail

M[a:=0; b:=1; a:=a+b] ∘
M[var a,b : integer]

M[b:=1; a:=a+b] ∘
M[a:=0] ∘
M[b : Integer] ∘
M[a : Integer]

And More Detail

M[a:=a+b] ∘
M[b:=1] ∘
M[a:=0] ∘
M[b : Integer] ∘
M[a : Integer]

The Meaning of a+b

M[a:=a+b] ≜ let rhs = M[a+b] in
let lhs = M[a] in ...

Problem -

M[a+b] **depends on the current values of** a **and** b

Storage

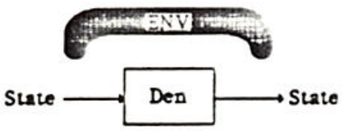
Need a model of storage:

State = LOC → Value

and of binding variables to values:

Env = Id → LOC

Overview



State - Model of files and store

Env - Model of variables etc.

M : Den → Env → (state → State)

Meaning Function for Addition

M : Den → Env → (State → State)

M[a:=a+b](ρ,s) ≜
let rhs = M[a+b](ρ,s) in
let lhs = M[a](ρ,s) in
s † [lhs → rhs]

M[a+b](ρ,s) △ s(M[a]ρ) + s(M[b]ρ)

M[x]ρ ≜ ρ(x)

Formal Definitions

Two Stages

1. **Check static semantics -**
   Can we build the function P?

2. **Dynamic semantics -**
   Build P

Statement Sequence

Concrete Syntax

statement sequence = statement, { ";", statement } ;

Abstract Syntax

Statement-sequence :: s-actions : seq of Statement
where
inv(mk-Statement-sequence(actions)) ≜ **len** actions≥1

Static Semantics

```
WF : Statement-sequence → Environment → B

WF[mk-Statement-sequence(actions)]ρ ≜
    ∀action∈elems actions . WF[action]ρ
```

Dynamic Semantics

```
M : Statement-sequence → Environment ⇒

M[mk-Statement-sequence(actions)]ρ ≜
    M[hd actions]ρ ;
    if len actions>1 then
      M[tl actions]ρ
    else
      skip
```

The Assignment Statement

Concrete Syntax

assignment statement = variable designator, assignment operator, expression ;
assignment operator = ":=" ;

Abstract Syntax

```
Assignment-statement ::  s-desig : Variable-designator
                         s-expr : Expression
```

Static Semantics

```
WF : Assignment-statement → Environment → B

WF[mk-Assignment-statement(desig,expr)]ρ ≜
    WF[desig]ρ ∧
    WF[expr]ρ ∧
    is-assignment-compatible(TV[desig]ρ,TE[expr]ρ)ρ
```

Dynamic Semantics

```
M : Assignment-statement → Environment ⇒

M[mk-Assignment-statement(desig,expr)]ρ ≜
    def lhs : M[desig]ρ;
    def rhs : M[expr]ρ;
    assign(lhs,rhs)ρ
```

If Statement

Abstract Syntax

```
If-statement ::          s-thens : seq of Guarded-statement
                         s-other : [ Statement-sequence ]

Guarded-statement ::     s-guard : Expression
                         s-body : Statement-sequence
```

Static Semantics

```
WF : If-statement → Environment → B

WF[mk-If-statement(thens,other)]ρ ≜
    (∀gs∈elems thens .
    WF[s-guard(gs)]ρ ∧
    TE[s-guard(gs)]ρ = Boolean-type ∧
    WF[s-body(gs)]ρ) ∧
    (other=nil ∨ WF[other]ρ)
```

Dynamic Semantics

```
M : If-statement → Environment ⇒

M[mk-If-statement(thens,other)]ρ ≜
    if thens = [] then
      execute-else-statements(other)ρ
    else
      let mk-Guarded-statement(guard,body)=hd thens in
      def value : M[guard]ρ;
      if value then
        M[body]ρ
      else
        M[mk-If-statement(tl thens,other)]ρ
```

While Statement - Static Semantics

```
WF : While-statement → Environment → B

WF[mk-While-statement(expr,body)]ρ ≜
    WF[expr]ρ ∧
    TE[expr]ρ = Boolean-type ∧
    WF[body]ρ
```

While Statement - Dynamic Semantics

```
M : While-statement → Environment ⇒

M[mk-While-statement(expr,body)]ρ ≜
    def value : M[expr]ρ ;
    if value then
      M[body]ρ;
      M[mk-While-statement(expr,body)]ρ
    else
      skip
```

Dissadvantages

- Cannot solve all problems
- Too accurate
- Can't avoid contentious issues
- Difficult to read

Advantages

Much greater accuracy

Provoke discussion

Better foundation for discussion

Can be read by "amateurs"

Summary

- Formal methods have improved definitions
- Problems have been resolved
- Better decisions of design can be made

C Language

- K&R language definition published - 1976-78
- Language base extensions - 1978-82
- Danger of fragmentation of C community - 1981-82
- Major C extensions for OOP / modularity - 1981-85
- ANSI C - 1983-89

ANSI C

- Positive experience
  - ☐ Discouraged dialects
  - ☐ Incorporated extensions, designed new features
  - ☐ ANSI C draft (1985) - review by the C community
  - ☐ Implementations started early - available in 1989
- Problems and delays
  - ☐ Late start - complicated by multiple C dialects
  - ☐ Late international participation - delayed standard

C Extensions for OOP / Greater Modularity

- Extensions
  - ☐ C with classes - 1981
  - ☐ Enhanced C - 1982
  - ☐ Objective C - 1983
  - ☐ Modular C - 1983
  - ☐ Concurrent C - 1985
  - ☐ Lesser known languages and C extensions
- Support of OOP / greater modularity is a must
- Danger of fragmentation of C community - 1985-87

C++

- Created by Bjarne Stroustrup at AT&T
- C++ advantages
  - C based language - ease transition
  - Supports OOP
  - Multiple inheritance
  - Efficiency - follows C philosophy
  - Expressiveness for complex computations
  - Flexibility for extensions

C++ acceptance

- Widely perceived as one of the languages best suited for software development

- Increasingly fast public acceptance
  - ☐ Fastest growing OO language on the market
  - ☐ Available where C is available
  - ☐ C++ related presentations, tutorials, and conferences
  - ☐ Many projects using it for development by choice
  - ☐ Many companies find it of strategic benefit

C++ status

- First language definition by B. Stroustrup - 1985
- Various publications
- Various implementations
  - ☐ Differences in the language definitions
  - ☐ New language features and extensions
- AT&T C++ Language System - Release 2.0
  - ☐ Large group of beta users
- AT&T 2.0 C++ Manual by B. Stroustrup
- Danger of multiple dialects - fragmentation
  - ☐ C++ standardization is a requirement

C++ committee

- Representation
  - Wide representation of C++ users and vendors
  - Personal invitation to Bjarne Stroustrup
  - Involvement of C++ experts
  - International participation
- Scope
  - Base language definition
  - Wanted extensions
  - Libraries
  - Environment and implementation issues
  - C++ and ANSI C
- Base document - AT&T 2.0 C++ Manual

Early international participation

- Goal
  - ☐ One international standard
  - ☐ Elimination of delays
- International participation
  - ☐ ANSI's open door policy
  - ☐ Invitation to participate
- Acceptance of ANSI C++
  - ☐ Encourage other C++ committees
  - ☐ Actual initiation and convening

C++ and ANSI C

- Compatibility issues
  - ☐ Language compatibility
  - ☐ Procedural compatibility

- ANSI C extensions
  - ☐ Numerical extensions group
  - ☐ Other future groups
  - ☐ Danger of fragmentation of C community

- ANSI C and ANSI C++
  - ☐ Collaboration and coordination - requirement
  - ☐ Official liaison